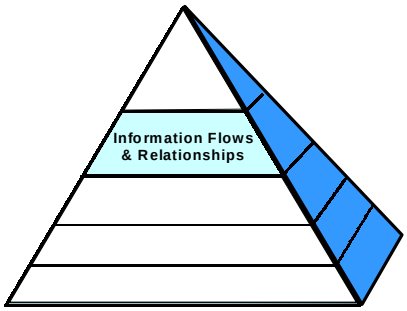
1.12.2.3 Other FEMA Business Processes and Functions

In addition to the mitigation, preparedness, response, and recovery, FEMA organizational elements also perform a number of other business functions that are important to the overall FEMA mission, and that are IT and networking significant. Appendix L briefly summarizes the major IT needs and requirements of the other FEMA business processes and functions that were expressed during the structured interviews.

1.12.3 FEMA Information Flows and Relationships

1.12.3.1 Introduction



This section of the *FEMA IT Architecture* briefly analyzes the information used by FEMA in its business processes and the movement of the information internal to and external to FEMA. The relationships among the various flows of information are also described in this section. These information flows indicate where the information is needed and how the information is shared to support FEMA's mission functions.

1.12.3.2 Organizational Entities and Their Information Flows

As highlighted in Section 1.12.2, Business Processes, information flow is critical to, and a central component of, FEMA's mission and business functions. That section of the *FEMA IT Architecture* briefly discusses high-level information flows associated with mitigation; preparedness, training and exercise support; and response and recovery.

Appendix L identifies high-level information flows associated with other business functions and processes including:

- GPRA reporting
- Insurance operations
- Systems engineering, maintenance, and configuration management of facilities, IT systems, and networks
- Handling of national security information
- Fire prevention and control training
- Training and exercise support
- Financial management
- Interchanges of high-volume GIS map information
- Acquisitions and purchasing
- Grants management.

External Agency Coordination. Across the FEMA enterprise, it is conservatively estimated that FEMA organizational elements interchange information with over 200 other external organizations. In addition, there is a large internal information flow. With this volume of

information flow, it is intractable to address all of the relationships among the various flows of information in this document.

For this initial *FEMA IT Architecture*, it was decided to address the information flow at a high level. Future revisions to this document may address information flow at a progressively more detailed level. Also, FEMA plans to capture the essential information flow elements in its *FEMA IT Architecture* Data Base (see Section 1.12.1 above and the discussion below).

Need to Consider External Partners. With the very large number of external agencies and organizations with which FEMA interchanges information, any discussion of information flow must properly consider external agency concerns. A considerable volume of the information flow requirements and their interrelationships are already well defined in the 12 Emergency Support Functions (ESFs) that are part of the *Federal Response Plan*.

With the guidance and direction of documents such as the *FEMA Strategic Plan*, the *Federal Response Plan*, and the *National Mitigation Strategy*, FEMA is working closely with its business partners to further define the structure and the required information flows. For example, the information flows associated with hurricanes have recently been promulgated for review. This effort is currently looking at 10 different hazards, 15 different time periods, and 67 different information categories. This effort is also developing accuracy requirements for the reported information. As noted above, formats for data interchange are also under consideration and development. In coordination with its business partners, FEMA is also identifying needs and requirements to assure vital information flow as part of the CIP initiative.

1.12.3.3 Methodology and Information Flow Requirements

As part of the structured interview process, ITS Directorate personnel conducted discussions on the high-level information flow requirements with all of the major FEMA directorates and administrations. The discussions on information focused on identifying the major high-level inputs and outputs for ultimate capture into the FEMA *IT Architecture* Data Base.

Figure 1-11 identifies the scope of the discussions that were conducted on major inputs and outputs. Appendix F summarizes the major high-level information flow requirements for the directorates and administrations. Appendix G provides more detail on the discussion of documents and data stores (Section 1.12.5) and identifies a large number of documents and data stores that are maintained by FEMA organizational elements. Many of these documents and data stores must be interchanged either internally or externally, also contributing to the requirements for information flow. Lastly, the NEMIS enterprise-wide data modeling approach addressed in Section 1.12.5 also provides a mechanism for identifying and describing the detailed information flow requirements.

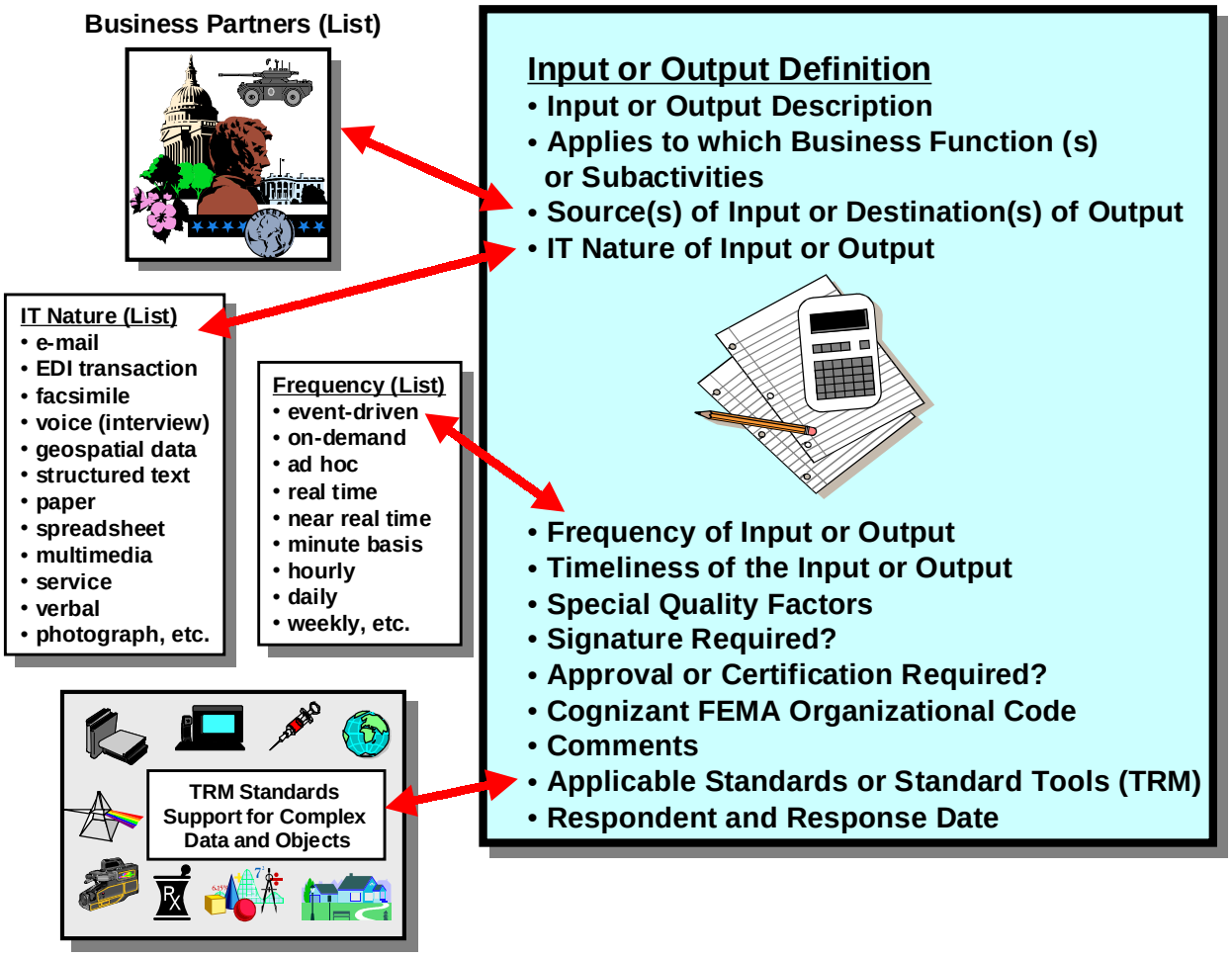
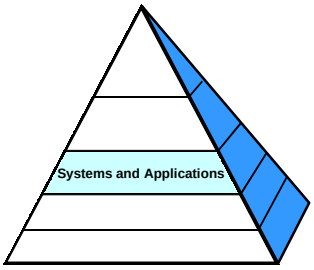


Figure 1-11. Scope of Structured Discussions on FEMA Information Flow Requirements

1.12.4 FEMA Systems and Applications

1.12.4.1 Introduction



This section of the *FEMA IT Architecture* addresses FEMA enterprise-wide and program-centric applications (and systems). Consistent with OMB M-97-16, these are applications that capture, manipulate, and manage the business information to support FEMA's mission operations. This section also briefly describes the high-level logical dependencies and relationships among FEMA's business activities, which are supported by the applications and systems.

1.12.4.2 Identification of Major IT and Software Applications to Support FEMA's Mission

Within FEMA, IT applications and systems are categorized as either:

- Enterprise-wide systems
- Program-centric systems.

Enterprise-Wide Systems

As illustrated in Figure 1-12, one of the objectives of the target *FEMA IT Architecture* is to achieve well-integrated enterprise-wide systems and services.

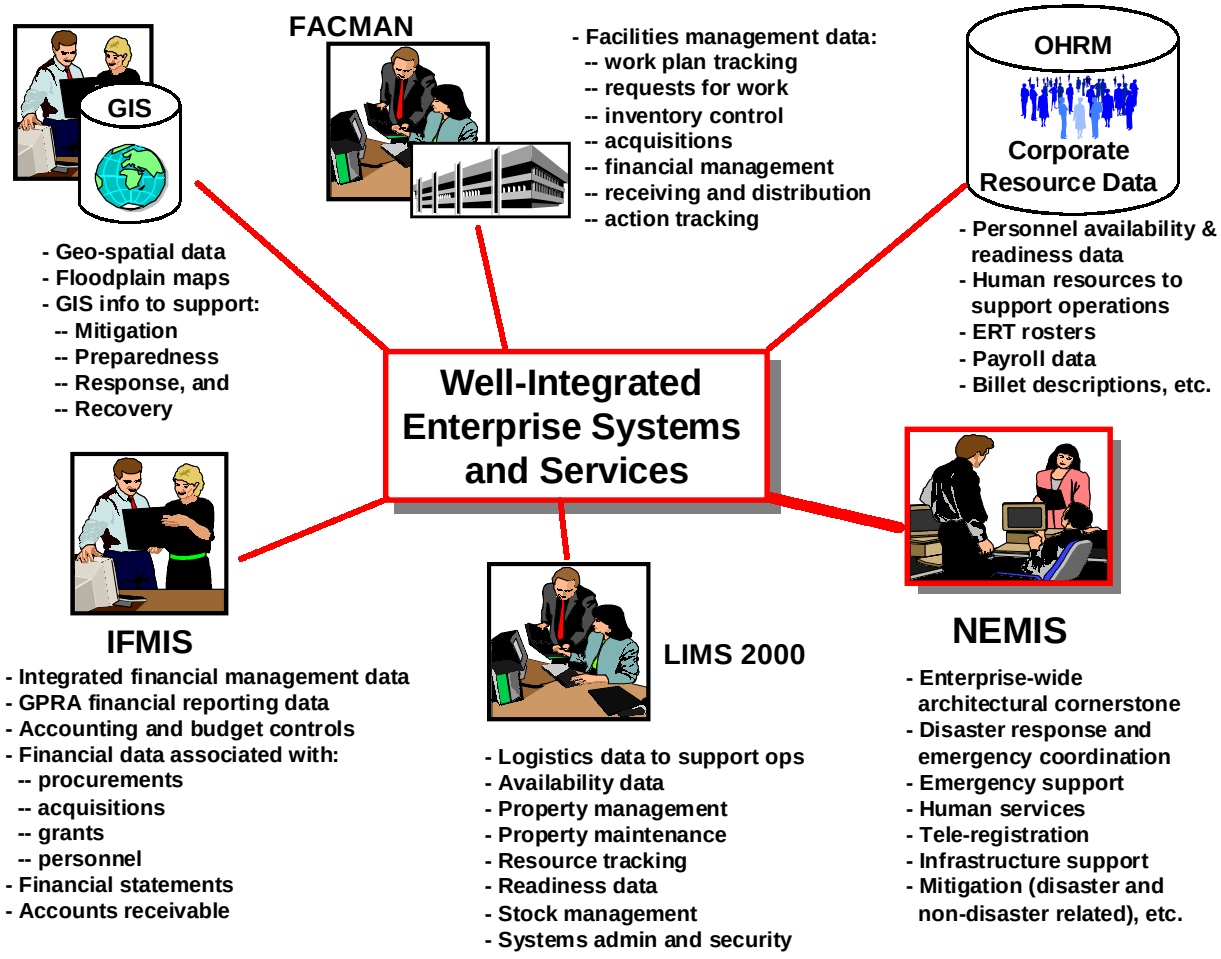


Figure 1-12. Target Architecture for Well-Integrated Enterprise Systems and Services

Listed below are the major FEMA enterprise-wide applications, with a brief description of the application. A more detailed description and discussion of the business functions the application supports, and the standard tools the application uses are provided in Appendix M .

National Emergency Management Information System (NEMIS) - NEMIS is an integrated system to provide FEMA, the States, and certain other Federal agencies with automation to perform disaster and non-disaster operations. NEMIS requirements support all phases of emergency management, from State mitigation planning to situation assessments, providing disaster assistance, command and control, programmatic planning, emergency support, and mitigation operations. NEMIS provides users at all Region, Headquarters, State, and Disaster Field Office (DFO) locations with standard processes to support emergency management wherever a disaster occurs. It supports information resources that enable FEMA to integrate preparedness, situation assessment, Preliminary Damage Assessment (PDA), and information and planning operations with FEMA programs and disaster assistance. This approach enables rapid

and coordinated transition from monitoring an incident to managing declarations, setting up DFOs, and providing assistance to communities and individuals affected by a disaster.

- **FEMA Enterprise-Wide Geographic Information System (GIS)** - Within FEMA, Geographic Information Systems (GISs) provide an good example of the opportunities and challenges of enterprise integration. Within FEMA, GIS is currently heavily used for floodplain mapping and insurance purposes. Data fusion from multiple sources, managed, and presented within an interactive GIS, can also support situation assessment and planning for the future evolution of a crisis.. A representative example of current Map Analysis Center GIS support for a hurricane consists of: 1) Executing a wind damage model prior to landfall and mapping probabilistic wind damage bands to help determine the required scope of response; 2) Integrating remote sensing data for damage assessment and assistance in response activity; and 3) Geocoding disaster assistance application data and overlaying the data with sensing data for a combined view of the disaster.

  In the future with distributed GIS available to States and local government via VPNs, a GIS map with building locations (drawn from a data base of residences and businesses) could be combined (for example) with sensor data on wind speed and direction to show where evacuation must take place. Integrating additional GIS-encoded data about the current location of emergency vehicles, shelters, evacuation personnel, and relief supplies could facilitate State/local evacuation planning and response and recovery functions for a wide scope of disasters. FEMA is in the process of establishing an enterprise-wide, integrated GIS capability to support mitigation; preparedness, training, and exercises; and response and recovery operations. This enterprise capability will assist in geographical data analysis, provide an interface to exchange GIS data within FEMA as well as external organizations, and serve as a maintenance medium for geospatial information.

- **Corporate Resource Data Base (CRD)** - FEMA's Office of Human Resources Management (OHRM) manages a set of personnel information systems that can be viewed as a corporate resource data base. These IT systems include the Automated Deployment Data Base (ADD), a payroll system, a standalone COTS automated classification system (COHO) and a standalone COTS automated knowledge-base for management of employee conduct and performance (CHINOOK). There is connectivity to several other systems and data bases (e.g., OPM, Department of Labor, National Finance Center, and Treasury). The CRD is comprised of data relative to processing personnel and payroll actions, reporting time and attendance, recording availability of personnel and tracking their assignments to disaster operations. It also can provide data to other FEMA organizational components through manual file transfers, including historical information for up to one year. With appropriate security access controls and privacy considerations, information within the CRD can be integrated with financial management data to form a more complete resource information data base and management reporting system with archival capability for up to six years. Further development of the CRD will include interface with other enterprise-wide systems, automated timekeeping, workforce management, automated requesting and tracking of personnel action requests, and executive and managerial information systems to include use of electronic signatures.

- **Logistics Information Management System (LIMS)** - LIMS is FEMA's automated agency-wide property management and logistics information management system. LIMS is being re-engineered to the LIMS 2000 system, which will be compatible in architecture with NEMIS. The future re-hosted system (LIMS 2000) will support agency-wide:

- Property management
- Equipment maintenance
- Readiness
- Inventory control
- Financial interface to IFMIS.

- **Integrated Financial Management Information System (IFMIS)** - Financial management is an important business function associated with both disaster and non-disaster operations. It is a particularly important function to management of FEMA's grants program with requirements to link financial reporting to performance measurements under the *Government Performance and Results Act (GPRA)*. The Integrated Financial Management Information System (IFMIS) was originally acquired from a software vendor. With re-hosting and re-engineering, IFMIS has become FEMA's enterprise-wide, financial management support system. The Office of Financial Management (OFM) has the responsibility for the development of IFMIS and its integration across the enterprise. IFMIS is the central component for achieving OFM's objectives to:
  - Improve financial management systems
  - Implement *Government Performance and Results Act (GPRA)* reporting
  - Issue accounting standards and financial statements
  - Develop Human Resources within the Office of Financial Management
  - Improve management of receivables
  - Ensure management accountability and control
  - Modernize payments and business methods
  - Improve administration of Federal assistance programs
  - Manage and administer the disaster relief fund.

- **Facilities Management System (FACMAN)** - FACilities MANagement (FACMAN) will be FEMA's system for facilities management support at Mt. Weather. It is intended to evolve into an enterprise-wide system, and to be integrated with NEMIS through the use of COTS products. (Note: There are a series of integrated systems in use at NETC that serve the same purpose as FACMAN. The NETC systems and FACMAN were the basis of a needs analysis that led to procurement of a COTS facility management package that will be an enterprise system.) FACMAN has the following functional requirements:
  - Work plan tracking
  - Requests for work
  - Inventory control
  - Acquisitions
  - Financial management
  - Receiving and distribution
  - Action tracking.

Program-Centric Applications

The number of these applications and systems is conservatively estimated at over 100. Appendix D provides a catalog of the program-centric systems. The current FEMA program-centric systems and applications manage, track, report, and maintain business information to support individual organizational element's specific missions and business functions. With some exceptions, program-centric systems are characterized as small in volume of information. In general, they support specialized business functions. Examples include a system to generate and manage FEMA identification badges and an automated forms management system for developing, filling out, and routing forms electronically around FEMA.

As the target *FEMA IT Architecture* evolves and IT services are adopted, developed, and integrated as enterprise-wide, common and reusable architectural components, it is anticipated that there will be some consolidation or elimination of program-centric systems. As illustrated in Figure 1-13, the architectural goal is to have a manageable set of program-centric systems to create, manage, and use documents and data across the enterprise.

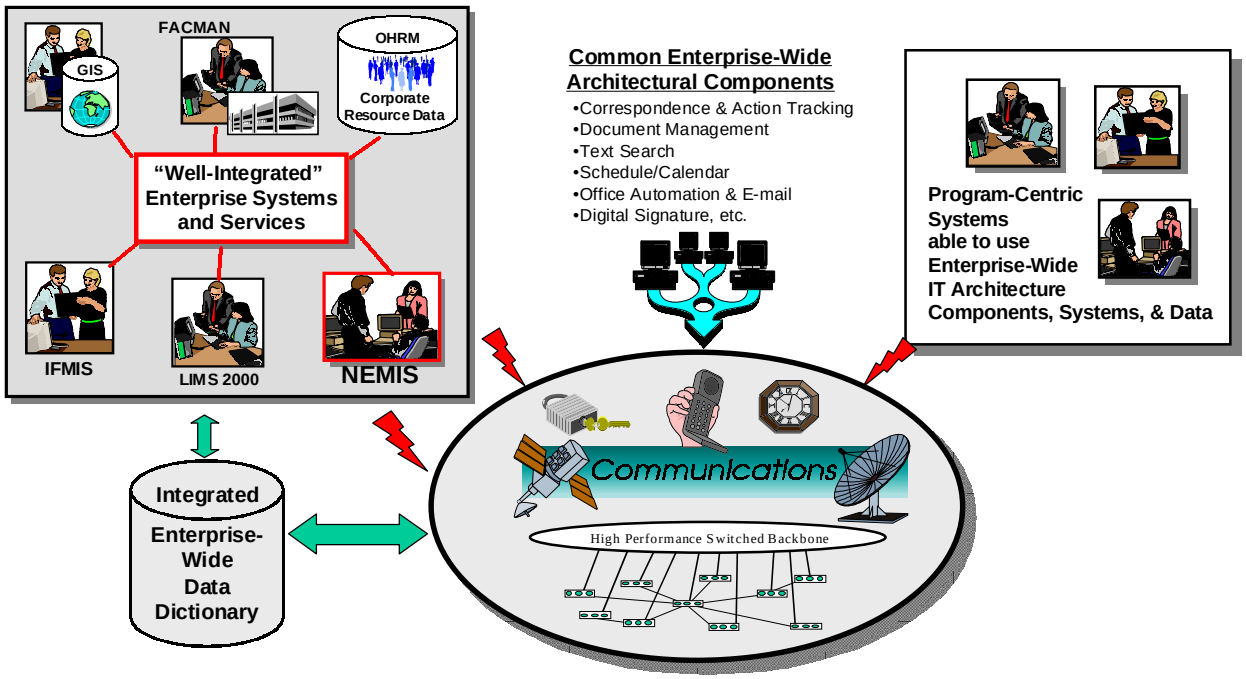
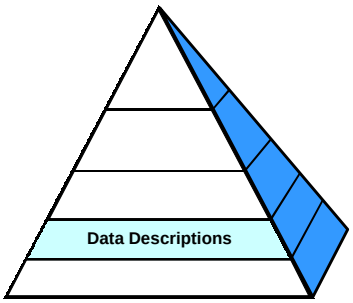


Figure 1-13. Architectural Concept for Integrating Program-Centric Systems

1.12.5 FEMA Data Descriptions

1.12.5.1 Introduction



This section of the *FEMA IT Architecture* addresses the FEMA high-level approach to data and document modeling. It explains how data is maintained, accessed, and used, from a data modeling perspective. The *FEMA IT Architecture* firmly establishes that data and document representation mechanisms are important for identifying information that can be shared across the enterprise, for minimizing redundancy, and for supporting new systems and applications. As the *IT Architecture* evolves, FEMA will gradually move towards a robust object-relational modeling approach.

1.12.5.2 Identification of FEMA Documents and Data Stores

The structured interview process identified a large number of documents and data stores that are currently maintained as either enterprise-wide information resources or as program-centric resources. This was accomplished by analyzing:

- Major business functions assigned to FEMA organizational elements
- Key information flows (internal and external to FEMA)
- Categories of data and documents contained in, or managed by, various FEMA systems and applications.

Appendix G provides the results of that analysis. Appendix G lists the major documents and data stores maintained by FEMA directorates and administrations.

1.12.5.3 Major IT Architectural Characteristics of Current Documents and Data Stores

The following list briefly summarizes the major IT architectural characteristics of current FEMA documents and data stores:

1. **A significant number of documents within FEMA are received, processed, and managed as paper.** Examples include documents received via mail or fax, as well as documents that are photocopied and disseminated around the Agency. Frequently, these documents must be physically signed for authentication and legal purposes.

2. **Paper-based correspondence is sometimes scanned and managed as images,** but this is not universally accomplished across FEMA. Comparatively little of the material that is scanned is converted to intelligent form via optical character recognition (OCR) techniques. The few documents that are OCRed are not indexed with a text search tool.

3. **Most of the documents that are in electronic form within FEMA are developed received, and maintained as office automation files.** These include: word processing files, PDF files, presentation graphics, and spreadsheets. Examples of these types of documents include: plans, policies, procedures, briefings, and reports. In general, the documents are not searchable and retrievable across the enterprise via an Intranet-based document management service. An exception is the comparatively few documents accessible on the FEMA Web site. A common form of interchange of electronic documents is as e-mail file attachments, though this approach is sometimes problematic due to occasional differences in sender and receiver e-mail systems. Generally speaking, this approach is a bigger problem for interchange of documents (as file attachments) with FEMA's external business partners.

4. **Comparatively few of the electronic documents that are created and/or interchanged (internally and externally) are in a structured format** with explicit content and structural tagging that would facilitate automated methods of routing and workflow management. Some structuring of word processing documents is loosely accomplished via templates, but this structuring is not universally accomplished and the authors can diverge from the template. Another exception is Web documents that are structurally-tagged using HTML, but that are largely used for one-way information dissemination only.

5. **Virtually all of the documents that are created and/or interchanged are as *unitary files*, not as collections of objects** in a Object Linking and Embedding (OLE) sense. While this approach facilitates document management as standalone files, it does not adequately support the storage and intelligent re-use of embedded

objects in the documents such as graphics, multimedia objects, and other entities such as spreadsheets and organization charts**.**

6. **From the point of view of automated transaction processing, FEMA does some EDI (Electronic Data Interchange)** with suppliers, vendors, and partners. However, much of this interchange is done in a point-to-point manner using customized or non-standard data transfer protocols, as opposed to ANSI X12 transaction sets, which are an open systems standard.

7. **Many of the program-centric systems and applications that have been developed use Microsoft Access as the data base management system of choice.** Access is accepted as an enterprise-wide standard tool for desktop data base efforts. Because these data bases are maintained locally, they are not accessible via on-line means across the enterprise.

8. **Within FEMA, increased emphasis is being placed on enterprise design and modeling of documents and data stores; and standardization using Oracle.** Examples of this activity include structuring of documents and data in projects such as the enterprise-wide GIS, IFMIS, LIMS, FACMAN, and NEMIS. NEMIS, in particular, has developed an approach to logical and physical data modeling which is currently adopted as the FEMA enterprise-wide standard data modeling approach. Within NEMIS, data and document representation mechanisms have proven useful for identifying information that can be shared across the enterprise, for minimizing redundancy, and for supporting new applications. With this attention to detail, more and more FEMA enterprise information is beginning to be represented in an intelligent format and to be interchanged via direct computer-to-computer data base transactions. An excellent example is the tele-registration component of NEMIS that supports vital human services needs during time of a crisis. Furthermore, this attention to detail is leading to increased re-use of documents and data, as well as improved document and data integrity. As the *FEMA IT Architecture* evolves and as tools are identified, it is anticipated that the current Entity-Relational modeling approach will mature to a more robust Object-Relational modeling approach.

1.12.5.4 FEMA Approach to Enterprise Data and Document Modeling

From a *FEMA IT Architecture* perspective, NEMIS implemented an enterprise-wide, standardized approach to data modeling using PowerSoft's S-Designor CASE tool (now called PowerDesigner). The current NEMIS Entity-Relational approach to enterprise-wide data modeling is described in more detail below.

Figure 1-14 provides a sample of the logical data model that was developed for the Emergency Coordination (EC) component of NEMIS. The NEMIS enterprise data models were developed in due consideration of FEMA's mission and major business functions. The NEMIS data models promote sharing of information across the enterprise and the elimination of redundancies. NEMIS has developed and documented comprehensive data models for the following:

- Human Services (HS)
- Infrastructure Support (IS)
- Mitigation (MT) (disaster and non-disaster)
- Emergency Coordination (EC)
- Emergency Support (ES).

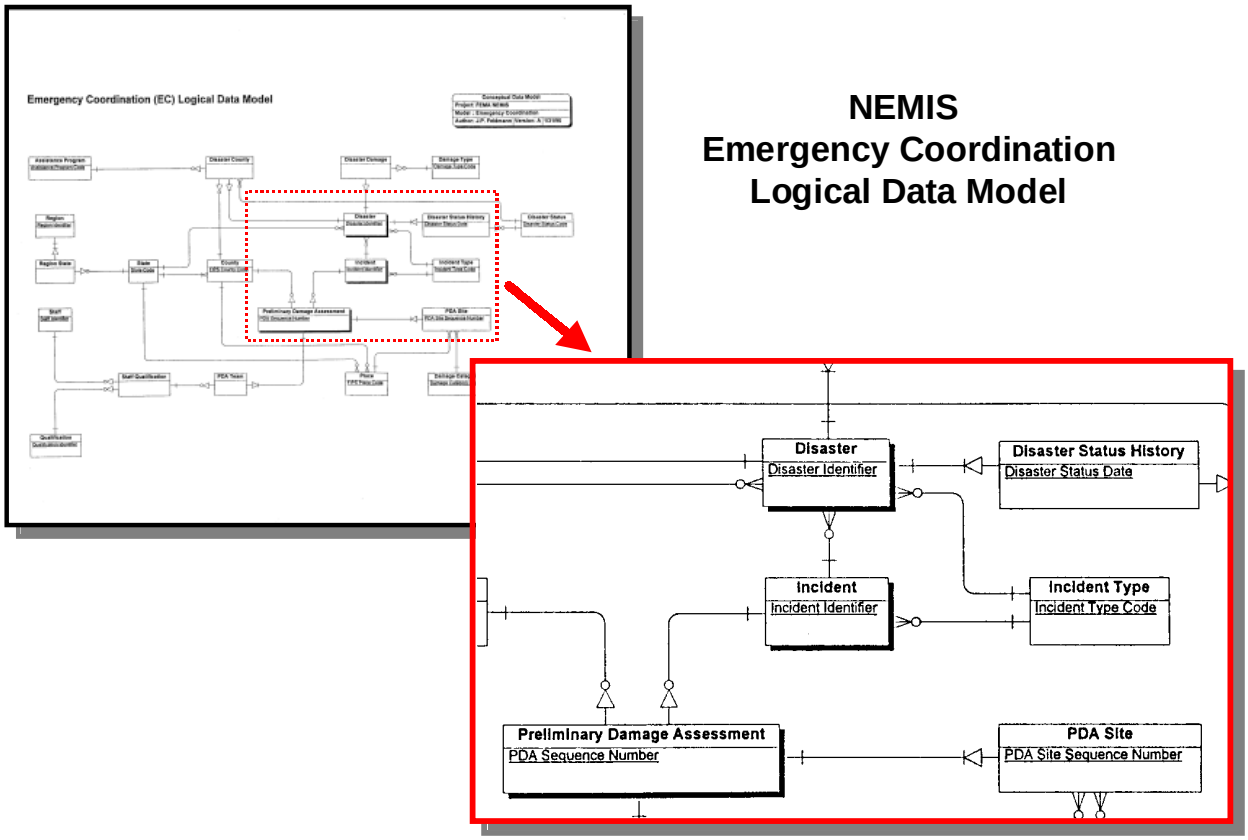


Figure 1-14. Sample NEMIS Logical Data Model

Within NEMIS, the data models include the following major components:

- **Logical Data Model.** The logical data model specifies the data structures and business rules needed to support a business area without consideration of the hardware or software that will be used to implement it. The logical data model indicates those entities that have been identified as occurring in more than one functional area, thereby promoting enterprise sharing.
- **Physical Data Model.** The NEMIS physical data model specifies the physical implementation of the data base showing all the tables, columns, and keys for the Oracle 7 relational data base. The physical data model also indicates entities that have been identified as occurring in more than one functional area.
- **Data Dictionary.** This portion of the NEMIS data modeling process contains the following reports:

    - **Entity Attribute Report.** The entity attribute report specifies in tabular format the name and definition for each data entity along with a list of all the data attributes associated with the entity. For each attribute, its corresponding data type and size is given along with an indication of whether it is a component of the primary key of the entity, and whether it is a mandatory field.

- **Attribute Report.** This report specifies in tabular format all the unique attributes in the model along with their characteristics, definition, and a where-used cross-reference.
- **Oracle Data Base Schema**. The Data Base Schema is the actual script that is used to create all the tables, columns, indices, and referential integrity constraints for the Oracle 7 relational data base.

1.12.5.5 Integration of Documents and Data

Within the target *FEMA IT Architecture*, documents can be viewed as collections of data objects. Currently, most electronic documents within FEMA IT systems consist of unstructured word processing and office automation files. Consistent with the principle of creating documents in their most intelligent form, managing them over their life-cycle, and then gaining maximum downstream reuse, FEMA is carefully moving towards a digital library concept where documents are intelligent, structured, and comprised of reusable objects. As this concept is gradually implemented, FEMA will migrate to a formal Object-Relational modeling approach. This Object-Relational approach is consistent with government and industry direction as part of the National and Global Information Infrastructure (NII/GII) initiative. The FEMA IT architectural approach is also facilitated by open systems standards such as SGML and XML, which are described in more detail in the Technical Reference Model. With strong industry support (e.g., Microsoft, Netscape, Oracle, and others), XML is intended to replace HTML as the preferred standard to represent and interchange complex documents on the Web. As illustrated in Figure 1-15, SGML and XML facilitate the structuring of documents and their linking with other documents, spreadsheets, and distributed data bases, maps and GIS representations, and external object files.

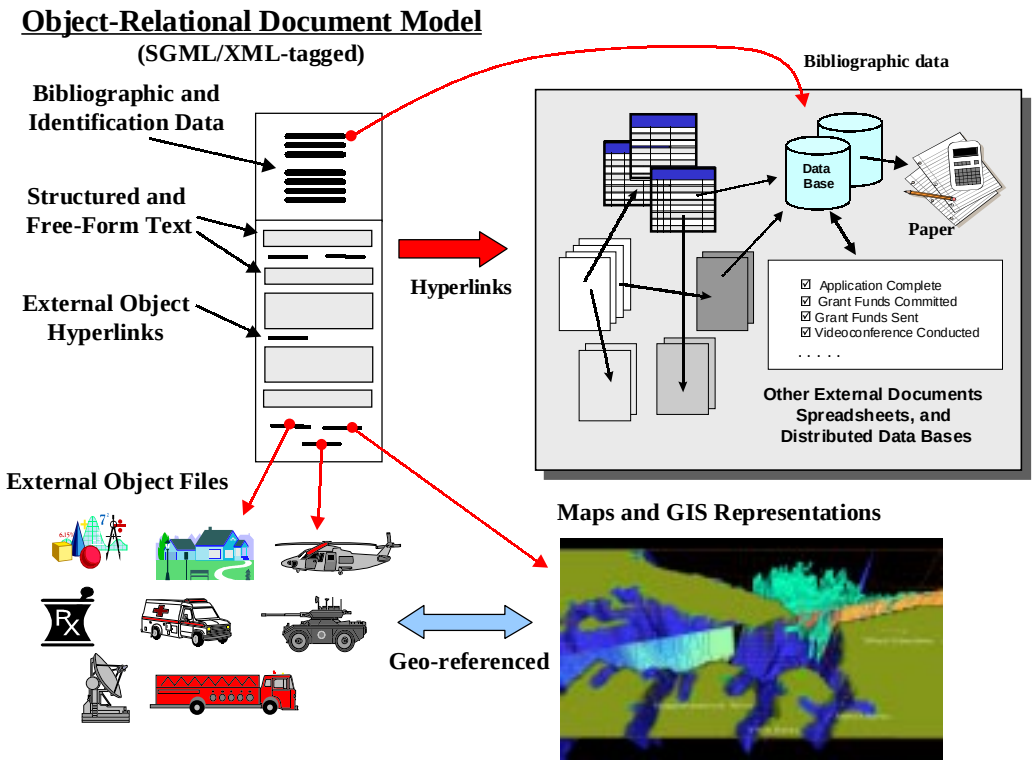


Figure 1-15. Integration of Documents and Data with an Object-Relational Document Model

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